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SPECIES COMPOSITION OF ICE ALGAL ASSEMBLAGES IN SAROMA KO LAGOON AND RESOLUTE PASSAGE, 1992 (EXTENDED ABSTRACT)

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Recently, ice algal assemblages are attracting attention as important primary producers during the freezing seasons in polar seas. Since ice algal biomass is often concentrated under the seasonal sea ice, the ice bottom turns brown. This phenomenon is well known not only in the Arctic and Antarctic, but also in the southern coastal regions of the Sea of Okhotsk, such as Monbetsu and Saroma Ko lagoon (HOSHIAI, 1981; HOSHIAI and FUKUCHI, 1981; SATOH *et al.*, 1989; FUKUCHI *et al.*, 1989).

In the present study, ice algal samples were collected from two extreme seasonal sea ice areas; the southernmost sea ice area (Saroma Ko lagoon, 44°N) and the high Arctic (Resolute Passage, 74°N). Identification and enumeration of each algal species were carried out by means of light-microscopy, and species composition

Table 1. Occurrence of species and their cell volume of ice algae in Saroma Ko lagoon, 1992.

Species	Cell volume (μm^3/cell)
Diatoms	
〈Centric〉	
Detonula confervaceae Hasle	1517
Melosira hyperborea (Grun)	17730
〈Pennate〉	
Entomoneis alata Kütz.	5972
Navicula pelagica Cleve	188
Navicula septentrionalis (Grun.)	359
Navicula transitans var. derasa (Grun.) Cleve	1331
Navicula vanhoeffenii Gran.	3113
Navicula sp.	479
Pinnularia quadratarea (Schmidt) Cleve *var. quadratarea*	11163
Other *Naviculaceae*	555
Nitzschia cylindrus (Grun.) Hasle	271
Nitzschia frigida Grun.	664
Flagellates	
Euglenophyceae	4769
Microflagellate (>20 μm)	680
Nannoflagellate (<20 μm)	523

at both regions was analyzed.

Analysis of the samples collected at Sakae-ura station (*ca.* 1.5 km offshore from the east coast of Saroma Ko lagoon) from February 25 to March 21, 1992, showed that 12 diatom species (2 centric diatom, 10 pennate diatom) and some species of flagellates were identified at the sea ice bottom, 0–5 cm (Table 1). Table 1 also indicates the cell volume of each species, calculated from measurement of each algal cell size. Carbon concentration in the bottom 0–5 cm of sea ice, which was

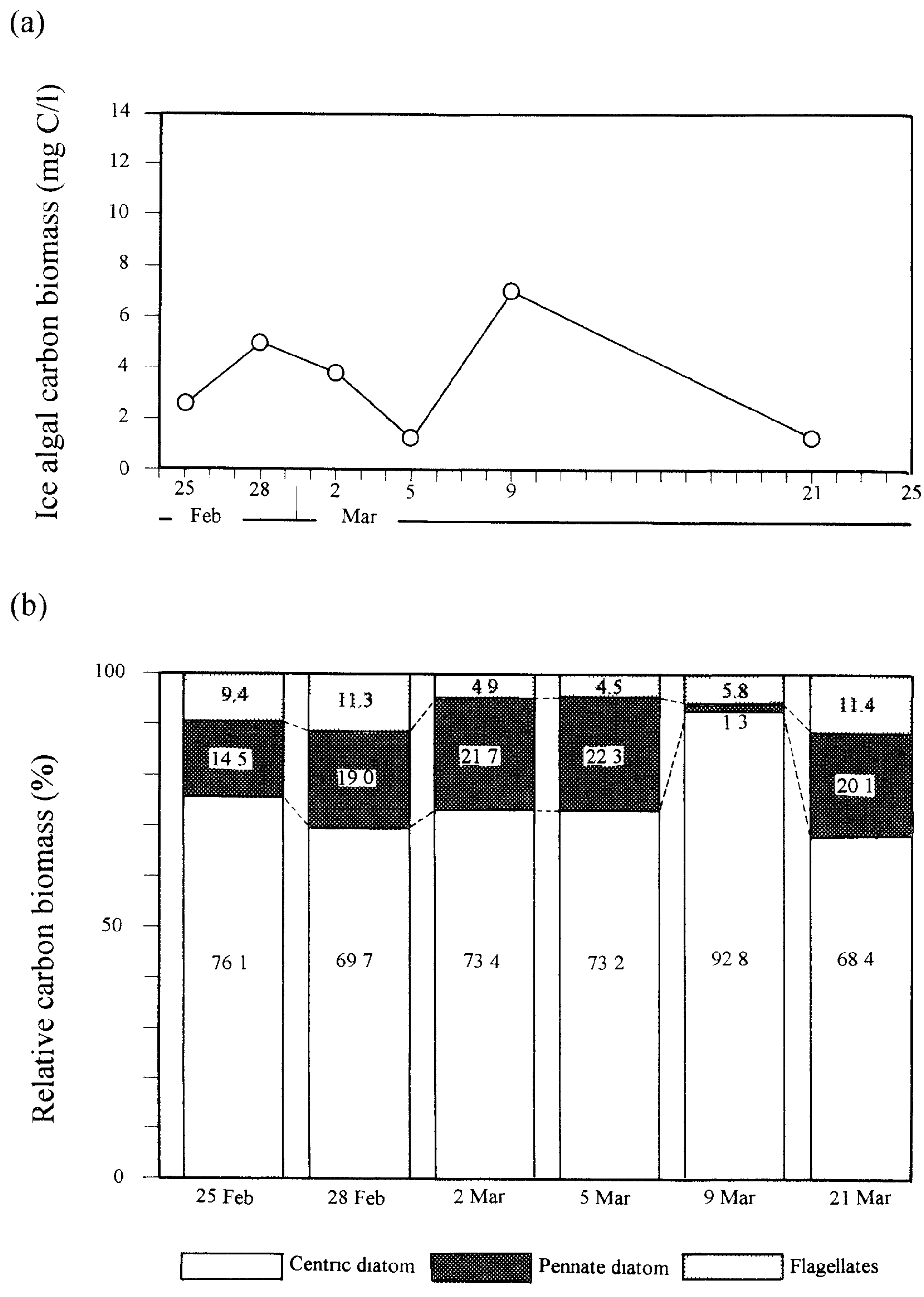

Fig. 1. Temporal changes in estimated carbon biomass of total ice algae (a) and its composition of ice algal groups (b) in Saroma Ko lagoon, 1992.

Table 2. Occurrence of species and their cell volume of ice algae in Resolute Passage, 1992.

Species	Cell volume (μm^3/cell)
Diatoms	
〈Centric〉	
Melosira hyperborea (Grun.)	11006
Thalassiosira sp. ϕ30–50 μm	22630
Chatoceros septentrionale Østr.	163
〈Pennate〉	
Amphora sp. (*A. lineolata* Ehrenb.?)	13826
Entomoneis concilians Cleve.	1500
Entomoneis kjellamii Cleve.	3588
Gyrosigma compactum (Grev.) Cleve	13388
Navicula crucigeoides Hust.	5885
Navicula kariana var. detersa (Grun.) Cleve	14832
Navicula kariana var. frigida Cleve	4206
Navicula kjellmanii Cleve	38330
Navicula kryokonites Cleve	1306
Navicula pagophila Grun.	7291
Navicula pelagica Cleve	333
Navicula septentrionalis (Grun.)	281
Navicula spicula (Hickie) Cleve	475
Navicula transitans Cleve *var. transitans*	7413
Navicula trigonocephala Cleve	7733
Navicula vanhoeffenii Gran.	1294
Navicula sp.	4955
Pinnularia quadratarea var. constricta (Østr.) Heid	8321
Pleurosigma clevei Cleve	5741
Pleurosigma stuxbergii Cleve	84875
Pseudogomphonema arcticum Grun.	1126
Pseudogomphonema groenlandicum Østr.	5285
Stenoneis inconspicua var. baculus (Cleve) Cleve	n.d.
Nitzschia angularis W. Smith	7956
Nitzschia arctica Cleve	2991
Nitzschia brebissonii var. borealis Cleve	10656
Nitzschia cylindrus (Grun.) Hasle	392
Nitzschia distans Cleve var.?	8736
Nitzschia frigida Grun	1516
Nitzschia gelida Cleve	11350
Nitzschia neofrigida Medlin	2686
Nitzschia seriata Cleve	427
Nitzschia sigma (Kütz.) W. Smith	3285
Nitzschia sp. (*N. gelida* Cleve var.?)	2512
Cylindrotheca closterium (Ehrenb.) W. Smith	148
Flagellates	
Euglenophyceae	n.d.
Microflagellate ($>20\,\mu$m)	4187
Nannoflagellate ($<20\,\mu$m)	523

n.d.: not determined

calculated from the total cell volume of each algal species*, doubled within 3 days in late February, and then decreased gradually to 1/5 at the beginning of March (Fig. 1a). The concentration increased again, reaching over 7 mg-C/*l* on March 9,

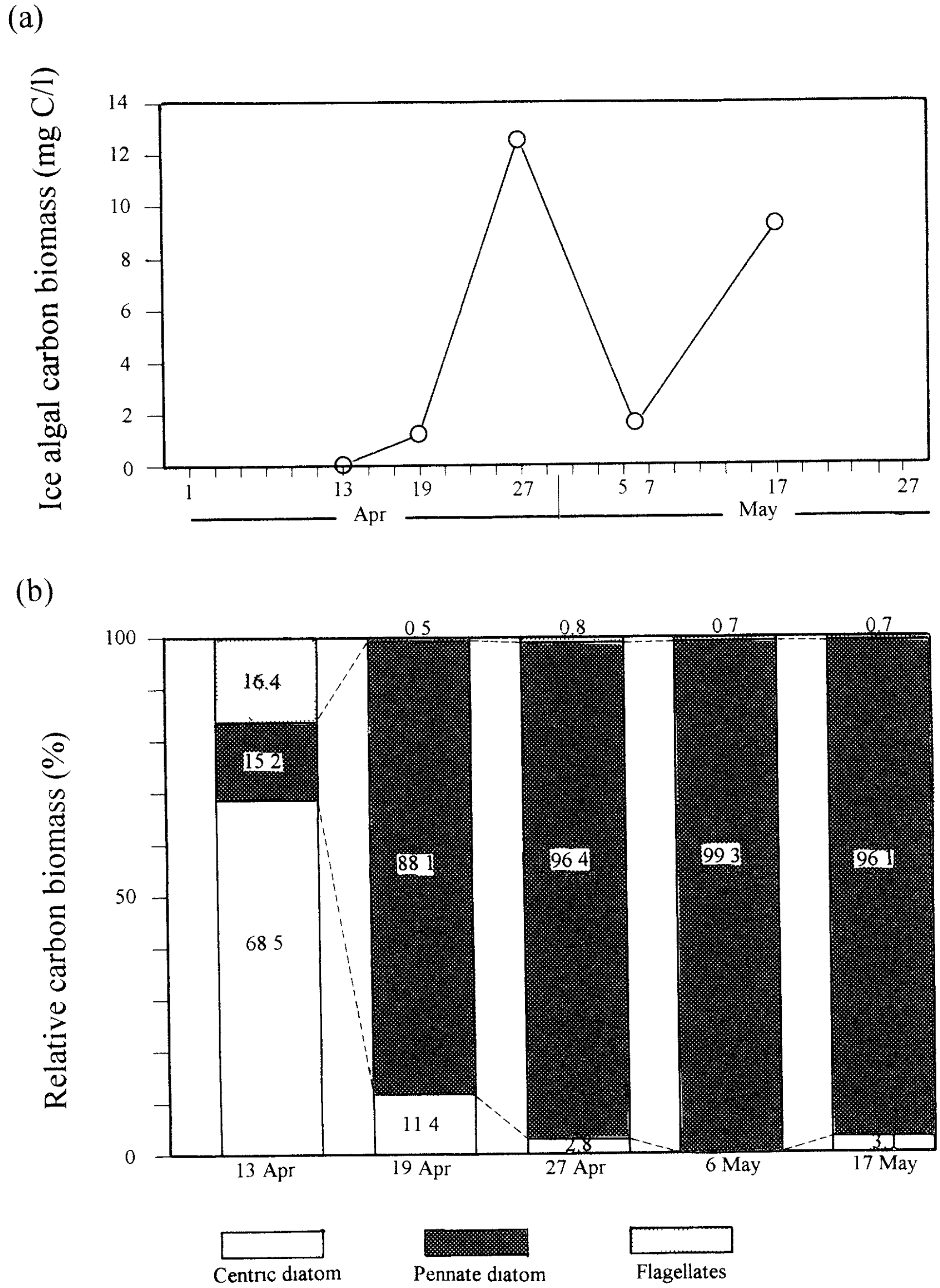

Fig. 2. Temporal changes in estimated carbon biomass of total ice algae (a) and its composition of algal groups (b) in Resolute Passage, 1992.

* The carbon quotient of each ice algal species was calculated from STRATHMANN's empirical equations (STRATHMANN, 1967) of logarithmic functions with algal cell volume. Cell volume was calculated from microscopic measurements of cell size. The carbon biomass of each algal species are then estimated by multiplying the cellular carbon quotient and cell numbers in given volume of collected samples.

but the high concentration was not maintained. More than 88% of the concentration consisted of diatom species throughout our study period (Fig. 1b). Especially, a centric diatom, *Detonula confercaceae*, always dominated; it accounted for more than 65% of total carbon biomass.

On the other hand, samples collected at Resolute Passage from April 13 to May 17 contained many diverse species (Table 2). Three species of centric diatoms, 35 species of pennate diatoms and several species of flagellates were identified (Fig. 2a). The carbon concentration increased during April and reached over 12 mg-C/*l* on April 27. The biomass suddenly decreased to <2 mg-C/*l* at the beginning of May, but it increased again in the middle of May. Pennate diatoms, *Nitzschia* and *Navicula* genus dominated except in the early stage of this study, when centric diatoms dominated (Fig. 2b).

In spite of the great latitudinal difference, some pennate diatoms, *Nitzschia cylindrus*, *N. frigida*, *Navicula septentrionalis* and *N. pelagica*, almost always accounted for more than 1% of the total carbon biomass at both sites. Especially in Resolute Passage, these pennate diatoms often dominated and accounted for nearly half of the carbon concentration of ice algae, except in the early stage of this study. The ubiquitous occurrence and the tendency to dominate of such pennate diatoms in high Arctic regions have been pointed out by POULIN (1990). Our results also show wide distribution of some pennate diatoms in seasonal sea ice regions and their domination in high Arctic Resolute Passage, as well as the centric diatom domination in low latitudinal sea ice, Saroma Ko lagoon. Moreover, a temporary increase of pennate diatoms over centric diatoms, which was shown in Resolute Passage in the blooming season, may suggest that such pennate species have much better ability to grow under high Arctic sea ice environments than centric diatoms.

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